CONTENTS

VOLUME 7 **1960**

INSTITUTE OF WELDING

Significance of Surface Preparation in Cold Pressure Welding, *by L. R. Vaidyanath and D. R. Milner* 1
Joining of Metals Conference
The Electric Arc in Welding: Introductory Survey, *by E. C. Rollason* 71
Arc Characteristics and their Significance in Welding, *by D. R. Milner, G. R. Salter, and J. B. Wilkinson* 73
Gas Absorption from Arc Atmospheres, *by G. R. Salter and D. R. Milner* 89
Metal Transfer in Inert-Gas Shielded-Arc Welding, *by J. C. Needham, C. J. Cooksey, and D. R. Milner* 101
Heat Transfer from Arcs, *by J. B. Wilkinson and D. R. Milner* 115
Reclamation by Metal Spraying, *by W. E. Ballard* 223
Performance Record of the Thermatool High Frequency Resistance Welding Process, *by L. A. Johnstone, F. J. Trotter, and H. F. a'Brassard* 238
Droplet Transfer During Arc Welding in Various Shielding Gases, *by L. F. Defize and P. C. van der Willigen* 297
Sprayed Metal Coatings for Abrasion, Corrosion, and Oxidation Resistance, *by G. R. Bell* 305
Sprayed Metal Coatings, *by G. A. Curson* 312
Hard-Facing with "Stellite" Powders, *by J. R. Gault* 318
Production Metallizing Machines, *by Lloyd Manuel* 323
Hard-Facing with Plasma Spray Guns, *by E. A. Gerhold* 327
Electron Beam Welding, *by M. E. Harper and E. G. Nunn* 331
Application of Electro-Slag Welding, *by A. M. Horsfield* 337
Semi-Automatic Welding with Fine Wires, *by R. V. Brimble, J. A. Lucey, and D. B. Tait* 342
A Note on Recent Experience with the Rockweld-Vus Electro-Slag Welding Machine *by W. K. B. Marshall* 393
Spot Welding of Carbon Manganese Steel, *by C. Phillips* 396
Fusion Welding of Beryllium, *by T. J. McDonald, N. F. Eaton, and D. B. Wright* .. 441
A Note on the Relationship between Chemical Composition and Hot-Cracking in Mild and Alloy Steels, *by W. K. B. Marshall* 451
A Note on the Brazing of Aluminium and its Alloys with Air/Propane, *by P. F. Woods* 489
Third Annual Lecture
The Influence of Welding on the Design of Ships, *by W. G. John* 491
Report of Council for 1959 541
Distribution of Phosphorus and Sulphur in Fully Austenitic Stainless Steel Welds, *by S. M. Makin, C. B. Alcock, D. R. Arkell, and P. C. L. Pfeil* 595
Whither Electrode Design? *by I. C. Fitch* 600
Welding Metallurgy of the Nimonic Alloys, *by J. Hinde and D. R. Thorneycroft* 605
Welding Problems Associated with Nuclear Fuel Elements, *by A. F. Taylor* 615
Cracking Tests for Assessing Weldability, *by J. C. Borland* 623
High Frequency Induction Brazing of Small Components in Argon Streams, *by P. M. Bartle and J. G. Young* 638
Use of Welding in Chemical Plants in the U.K.A.E.A., *by F. S. Dickinson and B. Watkins* 643
Welding of Precipitation-Hardening Corrosion-Resisting Steels, *by J. I. Morley and J. A. McWilliam* 651
Cracking in Welded Joints of Austenitic Steel in C.E.G.B. Power Stations, *by F. E. Asbury, B. Mitchell, and L. H. Toft* 667
The Problem of Welding High Temperature Service Metals, *by E. Kauhausen, P. Kaesmacher, and S. Sadowski* 693
Hot Pressure Welding of Titanium, *by C. F. Wilford and R. F. Tylecote* 708

DISCUSSION AND CORRESPONDENCE ON PAPERS

Spring Meeting 1959
Low Temperature Properties of Welded and Unwelded Al–5% Mg Alloy Plates—Extruded Aluminium Alloys for Low Temperature Service—Tear Tests on Aluminium–Magnesium Alloys—Low Temperature Properties of Aluminium–Magnesium Alloys 147

CONTENTS

VOLUME 7 **1960**

INSTITUTE OF WELDING

Significance of Surface Preparation in Cold Pressure Welding, *by L. R. Vaidyanath and D. R. Milner* 1
Joining of Metals Conference
The Electric Arc in Welding: Introductory Survey, *by E. C. Rollason* 71
Arc Characteristics and their Significance in Welding, *by D. R. Milner, G. R. Salter, and J. B. Wilkinson* 73
Gas Absorption from Arc Atmospheres, *by G. R. Salter and D. R. Milner* 89
Metal Transfer in Inert-Gas Shielded-Arc Welding, *by J. C. Needham, C. J. Cooksey, and D. R. Milner* 101
Heat Transfer from Arcs, *by J. B. Wilkinson and D. R. Milner* 115
Reclamation by Metal Spraying, *by W. E. Ballard* 223
Performance Record of the Thermatool High Frequency Resistance Welding Process, *by L. A. Johnstone, F. J. Trotter, and H. F. a'Brassard* 238
Droplet Transfer During Arc Welding in Various Shielding Gases, *by L. F. Defize and P. C. van der Willigen* 297
Sprayed Metal Coatings for Abrasion, Corrosion, and Oxidation Resistance, *by G. R. Bell* 305
Sprayed Metal Coatings, *by G. A. Curson* 312
Hard-Facing with "Stellite" Powders, *by J. R. Gault* 318
Production Metallizing Machines, *by Lloyd Manuel* 323
Hard-Facing with Plasma Spray Guns, *by E. A. Gerhold* 327
Electron Beam Welding, *by M. E. Harper and E. G. Nunn* 331
Application of Electro-Slag Welding, *by A. M. Horsfield* 337
Semi-Automatic Welding with Fine Wires, *by R. V. Brimble, J. A. Lucey, and D. B. Tait* 342
A Note on Recent Experience with the Rockweld-Vus Electro-Slag Welding Machine *by W. K. B. Marshall* 393
Spot Welding of Carbon Manganese Steel, *by C. Phillips* 396
Fusion Welding of Beryllium, *by T. J. McDonald, N. F. Eaton, and D. B. Wright* .. 441
A Note on the Relationship between Chemical Composition and Hot-Cracking in Mild and Alloy Steels, *by W. K. B. Marshall* 451
A Note on the Brazing of Aluminium and its Alloys with Air/Propane, *by P. F. Woods* 489
Third Annual Lecture
The Influence of Welding on the Design of Ships, *by W. G. John* 491
Report of Council for 1959 541
Distribution of Phosphorus and Sulphur in Fully Austenitic Stainless Steel Welds, *by S. M. Makin, C. B. Alcock, D. R. Arkell, and P. C. L. Pfeil* 595
Whither Electrode Design? *by I. C. Fitch* 600
Welding Metallurgy of the Nimonic Alloys, *by J. Hinde and D. R. Thorneycroft* 605
Welding Problems Associated with Nuclear Fuel Elements, *by A. F. Taylor* 615
Cracking Tests for Assessing Weldability, *by J. C. Borland* 623
High Frequency Induction Brazing of Small Components in Argon Streams, *by P. M. Bartle and J. G. Young* 638
Use of Welding in Chemical Plants in the U.K.A.E.A., *by F. S. Dickinson and B. Watkins* 643
Welding of Precipitation-Hardening Corrosion-Resisting Steels, *by J. I. Morley and J. A. McWilliam* 651
Cracking in Welded Joints of Austenitic Steel in C.E.G.B. Power Stations, *by F. E. Asbury, B. Mitchell, and L. H. Toft* 667
The Problem of Welding High Temperature Service Metals, *by E. Kauhausen, P. Kaesmacher, and S. Sadowski* 693
Hot Pressure Welding of Titanium, *by C. F. Wilford and R. F. Tylecote* 708

DISCUSSION AND CORRESPONDENCE ON PAPERS

Spring Meeting 1959
Low Temperature Properties of Welded and Unwelded Al–5% Mg Alloy Plates—Extruded Aluminium Alloys for Low Temperature Service—Tear Tests on Aluminium–Magnesium Alloys—Low Temperature Properties of Aluminium–Magnesium Alloys 147

A Survey of the Present Position on the Economics of Welding—Dynamics of Welding Production Management—Economics of Multi-Spotwelding—Structural Applications of Stud Welding 156
The Plasticity of Some Oxides 237
Stresses in Cylindrical Vessels 249
Symposium on Fatigue of Welded Structures
The Fatigue Strength of Butt Welds in Mild Steel—A Possibility for Increasing the Fatigue Strength of Butt Welded Joints 472, 513
The Fatigue Strength of Welded Joints in High Strength Steels 477
Influence of Weld Details on the Fatigue Strength of Welded Beams and Girders—Programmed Fatigue Testing of Full Size Welded Steel Structural Assemblies 517
The Fatigue Strength of Fillet Welded Joints in Steel—A Systemization of the Fatigue Strength Values of Mild Steel Welds.. 524
The Fatigue Strength of Welded Joints in High Strength Steels 477
Influence of Weld Details on the Fatigue Strength of Welded Beams and Girders—Programmed Fatigue Testing of Full Size Welded Steel Structural Assemblies 517
The Fatigue Strength of Fillet Welded Joints in Steel—A Systemization of the Fatigue Strength Values of Mild Steel Welds 524
Factors Influencing the Fatigue Behaviour of Welded Aluminium—The Effect of Mean Stress on the Fatigue Strength of Aluminium Alloy Butt Welded Joints.. 577
Future Research: Metallurgical Aspects—Future Research: Engineering Aspects 582
Effect of Rapid Heating and Cooling on the Microstructure of a Normalized 0·2% C Steel 557
Hot Cracking in Welds 558, 587

INTERNATIONAL INSTITUTE OF WELDING

Dynamic Behaviour of d.c. Generators for Arc Welding, *by A. Carrer*—Commission II 6
Use of Reference Blocks for Checking Ultrasonic Inspection Apparatus—Commission V 230
The Work of the International Institute of Welding 380
Recommended Practice for Radiographic Inspection of Fusion-Welded Joints: Circumferential Butt Joints in Steel Pipes up to 2 in. (50 mm) Wall Thickness—Commission V 410
Reports of Commissions I, II, IV, V, VI, VII, IX, X 454
Effects of Stresses due to Welding—Commission X 457
Houdremont Lecture 1959: Hydrogen in Welding, *by P. G. Bastien* 546

BRITISH WELDING RESEARCH ASSOCIATION

The Effect of Oxygen Additions to the CO_2–Shielded Metal Arc, *by A. A. Smith*.. .. 15
Stresses in Cylindrical Vessels, *by R. T. Rose* 19
Some Aspects of Cracking in Welded Cr–Ni Austenitic Steels, *by J. C. Borland and R. N. Younger* 22
Effect of Arsenic on Weldability and Notch Toughness of Mild Steel (To A.P.I. Grade B Specification).. 129
Symposium on Fatigue of Welded Structures
Foreword, *by R. Weck* 161
A Systemization of Fatigue Strength Values of Mild Steel Welds, *by A. Neumann*.. 162
Fatigue Strength of Butt Welds in Mild Steel, *by R. P. Newman* 169
Fatigue Strength of Fillet Welded Joints in Steel, *by T. R. Gurney* 178
Influence of Weld Details on Fatigue of Welded Beams and Girders, *by W. H Munse and J. E. Stallmeyer* 188
Effect of Mean Stress on Fatigue Properties of Aluminium Alloy Butt-Welded Joints, *by K. W. Gunn and R. McLester* 201
Increasing the Fatigue Strength of Butt-Welded Joints, *by W. Gilde* 208
Metallurgical Aspects of Future Research on Fatigue of Welded Structures, *by W. D. Biggs* 212
Factors Influencing the Fatigue Behaviour of Welded Aluminium, *by J. E. Tomlinson and J. L. Wood* 250
Future Research—Engineering Aspects, *by E. M. Lewis* 265
Programmed Fatigue Testing of Full Size Welded Steel Structural Assemblies, *by J. G. Whitman and J. F. Alder* 272
Fatigue of Welded Joints in High-Strength Steels, *by J. E. Stallmeyer and W. H. Munse* 281

Relationship between Microstructure and Mechanical Properties of Mild Steel Weld Deposits, *by K. J. Irvine and F. B. Pickering* 353
Flexural Fatigue Strength of Butt Welds in N.P. 5/6 Type Aluminium Alloy, *by J. L. Wood* 365
Influence of Residual Stresses on Fatigue Strength of Plates with Fillet Welded Attachments, *by T. R. Gurney* 415
Positional Welding of Steel with the CO_2 Process, *by A. A. Smith* 458
CO_2 Welding of Sheet Materials, *by A. G. Brain and A. A. Smith* 463
Autogenous Argonarc Welding of Zinc-Deoxidized Copper, *by K. J. Clews* 503
Generalized Theory of Super-Solidus Cracking in Welds (and Castings), *by J. C. Borland* 508
High-Tensile Preloaded Bolted Joints for Development of Full Plastic Moments, *by L. G. Johnson, J. C. Cannon, and L. A. Spooner* 560
Fatigue Strength of Beams with Stiffeners Welded to the Tension Flange, *by T. R. Gurney* 569

News and Announcements .. 60, 141, 217, 288, 383, 432, 482, 530, 588, 659, 686, 713
Current Welding Literature 68, 145, 294, 389, 439, 487, 539, 593, 665, 691
Book Notices 59, 216, 311, 431, 481, 576, 678, 685

ABBREVIATIONS

Abbreviations and symbols used in the *Journal* conform to B.S.1991, B.S.560, and B.S.813, and to other appropriate British Standards referring to welding.

PUBLISHED BY THE INSTITUTE OF WELDING

54 PRINCES GATE, LONDON, S.W.7

MADE AND PRINTED BY PERCY LUND, HUMPHRIES & CO. LTD.

LONDON AND BRADFORD

BRITISH WELDING JOURNAL

INDEX

VOLUME 7 1960

Abrasion, resistance to, sprayed metal coating for, 305
a'Brassard, H. F., biographical note, 290; *see also* Johnstone, L. A.
Alcock, C. B., *see* Makin, S. M.
Alder, J. F., biographical note, 290; fatigue of welded structures, 521, 522, 523, 583, 584; *see also* Whitman, J. G.
Alloy steel, chemical composition and hot cracking in relationship between, 451; electrodes, 600
Aluminium, in argon, material transfer, 102; brazing with air/propane, 489; welded, fatigue of, 250, 577
Aluminium alloys, brazing with air/propane; butt welded joints, effect of mean stress on, 577; butt-welded joints, effect of mean stress on fatigue properties, 201; butt welds, flexural fatigue strength of, 365; extruded, for low-temperature service, 147; semi-automatic welding with fine wires, 346
Aluminium-magnesium alloys, low-temperature properties, 147; low-temperature properties of welded and unwelded plates, 147; tear tests on, 147
Arc(s), atmospheres, gas absorption from, 89; characteristics, significance of, 73; electric, conference on, 71; heat transfer from, 115; plasma jets in, 119; reactions in, 600
Arc welding
argon-arc: ferritic steels, 696
autogenous argon-arc, of Zn-deoxidized Cu, 503
CO_2-shielded metal-arc, effect of oxygen additions, in, 15; positional, 458; of sheet, 463
d.c. generators for, 6
inert-gas shielded: droplet transfer in, 297; metal transfer in, 101
inert-gas shielded metal-arc: of ferritic steels, 695; semi-automatic, with fine wires, 342
inert-gas tungsten-arc, of Zn-oxidized Cu, 503
metal arc: semi-automatic, with fine wires, 342; *see also* inert-gas shielded (*above*)
report of Commission, 454
submerged-arc, of ferritic steels, 694
Arc welds, argon-arc, in mild steel, microstructure of, 353; metal-arc, in mild steel, microstructure of, 353
Argon, Al in, metal transfer, 102; brazing in, 638
Arkell, D. R., *see* Makin, S. M.
Arsenic, effect on mechanical properties, 137; effect on weldability and notch toughness of mild steel, 129
Asbury, F. E., biographical note, 714
Asbury, F. E., Mitchell, B., and **Toft, L. H.,** cracking in welded joints in austenitic steel, 667
Atomic hydrogen welds, in steel, microstructure of, 353
Austenite, inhomogeneity of, 214
Austenitic steel, cracking in welded joints, 667; semi-austenitic, welding, 655; welding for high-temperature service, 701
Autoradiography, *see* Radiography

Bailey, J. C., Al alloys, 152
Baker, R. G., fatigue of welded structures, 476, 583; *see also* Calvo, F. A. C.
Baldwin, T., fatigue of welded structures, 585
Ballard, W. E., biographical note, 290; reclamation by metal spraying, 223
Bartle, P. M., biographical note, 660
Bartle, P. M., and **Young, J. G.,** induction brazing in A, 638
Bastien, P. G., hydrogen in welding, 546
Beams, plain, influence of weld details on fatigue, 190; spliced, influence of weld details on fatigue, 190; with stiffeners welded to tension flange, fatigue strength of, 569; welded, fatigue strength of, 517; welded, influence of weld details on fatigue of, 188
Bell, G. R., biographical note, 383; sprayed metal coatings, 305
Bentley, K. P., *see* Calvo, F. A. C.
Berridge, P. S. A., fatigue of welded structures, 520, 524
Beryllium, fusion welding, 441; welding, 618
Betteridge, W., Nimonic alloys (*book review*), 685
Biggs, W. D., fatigue of welded structures, 212; future research—metallurgical aspects, 582
Birkhead, M., low-temperature properties of Al alloys, 147
Blair, J. S., fatigue of welded structures, 473, 479, 480
Bolted joints, high-tensile preloaded, 560
Borland, J. C., cracking tests, 623; hot cracking in welds (*Letter*), 558–559; super-solidus cracking, 508
Borland, J. C., and **Younger, R. N.,** cracking in welded Cr–Ni austenitic steels, 22
Boyd, G. M., low-temperature properties of Al alloys, 148; metallurgical changes during testing, 151; stresses in cylindrical vessels (*letter*), 249
Brain, A. G., biographical note, 483
Brain, A. G., and **Smith, A. A.,** CO_2 welding of sheet, 463
Braithwaite, R. G., fatigue of welded structures, 529, 585,
Brayden, C. M., obituary, 589
Brazing, of Al and Al alloys with air/propane, 489; high-frequency induction in A streams, 638; Nimonic alloys, 613
Brimble, R. V., Lucey, J. A., and **Tait, D. B.,** semi-automatic welding with fine wires, 342
British Oxygen Co. Ltd., reorganization, 717
British Welding Research Association, controlled thermal severity test, 135; design advisory service of, 65; design of welded pipe fittings (*handbook*) 389; engineering materials and design exhibition, 220; T. Haas appointed head of design section, 64; London office, 144; measuring the hydrogen content of steels, 590; plastic properties of rolled sections, 220; regional conferences, 590; symposium on fatigue of welded structures, 144; visit of fatigue symposium delegates to Abington, 436
Brittle fracture, in ship construction, 497
Brittleness-shrinkage theory, 509
Butt-welded joints, Al-alloy, effect of mean stress on fatigue properties of, 201; Al-alloy, effect of mean stress on fatigue strength, 577; Al-alloy, flexural fatigue strength, 365; fatigue strength of, 208, 472; longitudinal, fatigue tests on, 284; in mild steel, fatigue strength of, 169, 472; transverse, fatigue tests on, 281

Cable sheathing, by high frequency resistance welding, 248
Calvo, F. A. C., Bentley, K. P., and **Baker, R. G.,** effect of heating and cooling on microstructure of C steel (*Letter*), 557–558
Cannon, J. C., *see* Johnson, L. G.
Carbon, addition to Cr–Ni weld metal, 33
Carbon–manganese steel, spot welding, 396
Carbon steel, effect of heating and cooling on microstructure, 557
Carlson, W. B., fatigue of welded structures, 474
Carrer, A., d.c. generators for arc welding, 6
Cast steel, comparison with welded and wrought steel, 546

Castings, super-solidus cracking in, 508
Ceramic spraying, 229
Chapman, J. C., *see* Taylor, R. W.
Charlton, T. M., test on pitched roof portal structure, 679
Chemical apparatus, corrosion of, 431
Chemical composition, relationship with hot cracking in mild and alloy steels, 451
Chemical plants, welding in, 643
Chromium–nickel steels, austenitic, welded, cracking in, 22
Chromium steel, welding for high-temperature service, 699
Clews, K. J., biographical note, 534; welding of Zn-oxidized Cu, 503
Coatings, compound, metal sprayed, 316; protective, metal sprayed, 314; sprayed metal, 305, 312
Cold working, effect in Cr–Ni steels, 47
Cooksey, C. J., biographical note, 290; *see also* Needham, J. C.
Cooling, effect on microstructure of normalized C steel, 557
Copper, addition to Cr–Ni weld metal, 39; autogenous argon-arc welding of Zn-deoxidized, 503; semi-automatic welding with fine wires, 350
Corrosion of chemical apparatus, 431; resistance to, sprayed metal coatings for, 305; ship, 502
Corrosion-resistant steel, welding of, 651
Cover plates, influence on fatigue of welded beams, 199
Cowley, W. E., fatigue of welded structures, 473, 583
Cracking, cracks, base-metal, in Cr–Ni steels, 42; base metal, theories of, 52; effect of temperature, stress and time, 40; fatigue, development of, 277; formed after welding, 56; formed during welding, 56; forms of, 702; hot, liquation theories of, 49; hot, longitudinal, 52; hot, relationship with chemical composition in mild and alloy steels, 451; hot, transverse, 52; hot, in welds, 558, 587; liquation theories of, 52; stress rupture theories, 55; super-solidus, in welds and castings, 508; weld-metal, 27, 56; weld metal, theories of, 49; in welded Cr–Ni austenitic steels, 22; in welded joints of austenitic steel in power stations, 667
Cracking tests, base-metal, 44; B.W.R.A. controlled thermal severity, 135; hot, Murex, 136; Houldcroft fishbone, 135; Reeve fillet weld, 133; underbead and heat-affected zone, 629; for weldability assessment, 623
Curson, G. A., sprayed metal coatings, 312
Cutting, technology of (*book review*), 678
Cylindrical vessels, stresses in, 19, 249 (*letter*)

Defize, L. F., biographical note, 290
Defize, L. F., and **Van der Willigen, P. C.,** droplet transfer during shielded arc welding, 297
Design of welded constructions (*book review*), 216
Dickinson, F. S., biographical note, 660
Dickinson, F. S., and **Watkins, B.,** welding in chemical plants, 643
Dixon, D. C., fatigue of welded structures, 480, 529
Documentation, report of Commission, 455
Droplet transfer in arc welding inert gas shielded, 297
Ductility, hot, measurements of, 44
Durham, R. J., extruded Al alloys for low-temperature service, 147
Dwight, J. B., fatigue of welded structures, 580
Dynamics of welding production management, 156

Eaton, N. F., biographical note, 482; *see also* McDonald, T. J.
Economics of multi-spot welding, 156; of welding, 156
Education and training, select conference on advanced, 530
Electro-slag welding, applications of, 341; defects in, 340; filler metals for, 339; fluxes for, 339; mechanical properties of weld metal, 340; process and applications, 337; Rockweld-Vus machine, 393
Electrodes, design, 600; effective size of, 604; iron powder, 603; low-hydrogen, 602; low-hydrogen, baking, 602; low-hydrogen, moisture in, 602; Ni, 706; for spot welding of C–Mn steel, 408
Electron beam welding, 331
Electron gun, 331
Elliott, E., Al casting alloys, 150
Engineering aspects of future research, 582
Erker, A., Hermsen, H. W., and **Stoll, A.,** design and calculation of welded constructions (*book review*), 216

Fatigue, behaviour of welded Al, 577; cracks, development of, 277; failures, location of, 285, 287; flexural, strength of butt welds in Al alloy, 365; fractures, location of, 277; properties of Al alloy butt-weldeo joints, effect of mean stress on, 201; S/N diagram, 213; strength of Al alloy butt welded joints, effect of mean stress on, 577; strength of beams with stiffeners welded to tension flange, 569; strength of butt-welded joints, 208, 472; strength of butt welds in mild steel, 169, 472; strength of fillet welded joints, improvement by induced residual stresses, 185; strength of fillet welded joints in steel, 178, 524; strength of mild steel welds, 162, 524; strength of plates with fillet welded attachments, influence of residual stresses on, 415; strength of welded beams and girders, influence of weld details on, 188, 517; strength of welded joints in high strength steels, 477; welded aluminium, 250; welded joints, 214; welded joints in high-strength steels, 281; welded and riveted joints, comparison of, 263; welded structures, symposium on, 144, 161, 250, 265, 272, 281; welded structures, symposium on, discussion at, 472, 513, 577; welded structures, engineering aspects of future research, 265; welded structures, metallurgical aspects of future research, 212
Fatigue-testing machines, panel, 273
Fatigue tests, basic S/N curve, 278; full size welded steel structural assemblies, 272, 517
Fenton, K. W. O., fatigue of welded structures, 586
Ferrite, delta, effect in Cr–Ni steels, 49
Ferritic steel, welding for high-temperature service, 694
Filler materials for austenitic steels, 704; for ferritic steels, 696
Filler metals for electro-slag welding, 339
Fillet welded joints, fatigue strength, 178, 524; fatigue strength, improvement by induced residual stresses, 185; fatigue tests on, 286
Finishing in reclamation by spray welding, 227
Fitch, I. C., electrode design, 600
Flaws, effect on fatigue properties of butt-welded joints, 204
Flintham, E., economics and productivity of welding, 156; low-temperature properties of Al alloys, 149
Fluxes, for electro-slag welding, 339
Fractures, fatigue, location of, 277; *see also* Cracking
Frames, portal, test on pitched, 679
Fuchs, E., elected President for 1960–61, 531; biographical note, 531
Fusion welding, beryllium, 441

Gardiner, K., fatigue of welded structures, 476
Gas absorption from arc atmospheres, 89
Gas welding, ferritic steels, 695; report of Commission, 454
Gault, J. R., biographical note, 384; hard-facing with "Stellite" powders, 318
Generators, d.c., for arc welding, 6
Gerhold, E. A., hard-facing with plasma spray gun, 327
Gilde, W., biographical note, 291; fatigue strength of butt-welded joints, 208, 472; fatigue of welded structures, 580, 581, 583
Girders, welded, influence of weld details on fatigue of, 188, 517
Grain size, effect in Cr–Ni steels, 47
Gray, C. S., fatigue of welded structures, 585
Guerrera, U., fatigue of welded structures, 513, 522
Gunn, K., biographical note, 218; fatigue of welded structures, 522
Gunn, K. W., and **McLester, R.,** fatigue properties of butt-welded Al joints, 201, 577
Gunther, W., and **Proschek, F.** Die Alumino-thermische Schweissung (*book review*), 311
Gurney, T. R., fatigue strength of beams, 569; fatigue strength of fillet welded joints, 178, 524; fatigue of welded structures, 480, 520, 577, 586; influence of residual stresses on fatigue strength, 415

Haas, T., fatigue of welded structures, 520, 581
Hadfield, F., obituary, 141
Haim, G., manual for plastic welding (*book review*), 576
Hard-facing, with plasma spray-guns, 327; by spray welding, 228; by spray welding, materials for, 308; with "Stellite" powders, 318
Hard-facing alloys, nickel–chromium–boride–silicate, 305
Hargreaves, R., Al–Mg alloy, 148
Harper, M. E., biographical note, 384
Harper, M. E., and **Nunn, E. G.,** electron beam welding, 331

Hartley, A. C., obituary, 217
Health, *see* Safety and health
Heat transfer from arcs, 115
Heat treatment, austenitic-steel welds, 705; Cr-steel welds, 700; ferritic-steel welds, 698; post weld, for Cr–Ni steels, 40; for spot welding of C–Mn steel, 400; Ti welded joints, 711
Heating, effect on microstructure of normalized C steel, 557
Herden, G., Schweiss- und Schneidtechnik (*book review*), 678
Hermsen, H. W., *see* Erker, A.
High-strength steel, fatigue of welded joints, 281, 477
High-temperature materials, welding, 693
High-tensile steel, fatigue strengths, 184
Hinde, J., biographical note, 660
Hinde, J., and **Thorneycroft, D. R.**, Nimonic alloys, 605
Hirst, S., obituary, 63
Holliday, W. C., spherical vessels, 150
Horne, M. R., plastic properties of rolled sections, 220
Horsfield, A. M., electro-slag welding, 337
Hot tearing, strain theory, 51, 509
Houdremont Lecture (1959), hydrogen in welding, by P. G. Bastien, 546
Houldcroft Fishbone test, 135
Hydrogen, addition to Cr–Ni weld metal, 39; content of steels, measuring, 590; in welding, 546
Hydrogen embrittlement, basic characteristics, 549; mechanism of, 553

Inconel, welding, 647
Inspection and testing, beryllium welds, 619; nuclear fuel elements, 617; *see also* Testing
Institute of Welding, Annual Dinner (1959), 62; Autumn Meeting (1959), 60; awards (1959), 542; balance sheet, 544; branches—*see below*; Christmas Lecture to young people, 60, 288; Council for 1960–61, 531; Council members, *ex officio*, 60; Council nominations, 288; educational policy, 288; election of members, 289, 432, 588; finances, 543; income and expenditure account, 545; Larke medal (1960) awards, 288; membership, 543; Report of Council (1959), 541; select conference on advanced education in welding, 530; Spring Meeting (1959), 147; Spring Meeting (1960), 532; staff changes, 482; Third Annual Lecture on Welding and design of ships, by W. G. John, 289, 491; Tibbenham prize, 60; welding mission to U.S.S.R., 288; Year Book, 289; *see also* School of Welding Technology

Branch news:
Birmingham, 219, 661, 663,* 687†
East Midlands, 63, 143, 292, 661, 663,* 687†
East of Scotland, 63, 384, 433, 483, 661, 663,* 687†
Eastern Counties, 663,* 686, 687†
Indian, 663,* 687†
Leeds, 143, 219, 385, 661, 663,* 687†
Liverpool, 483, 589, 661, 663,* 687†
Manchester, 64, 218, 292, 433, 589, 661, 663,* 687,† 714
North Eastern (Tees-side), 662, 663,* 687†
North Eastern (Tyneside) 219, 662, 663,* 687†
North London, 64, 219, 292, 434, 483, 535, 663,* 686, 687†
Slough Section, 663*
Preston, 64, 662, 663,* 688†
Sheffield, 292, 662, 663,* 688†
South London, 219, 385, 435, 534, 535, 663,* 686, 688,† 715
Medway Section, 662, 663,* 688†
South Wales, 435, 663,* 688,† 715
South Western, 64, 219, 662, 663,* 688†
Southern Counties, 662, 663,* 688†
West of Scotland, 64, 218, 386, 435, 662, 663,* 688†
Wolverhampton, 143, 292, 386, 435, 483, 663, 663,* 688†
* indicates name and address of Hon. Sec.
† indicates Committees for 1960–61
International Institute of Welding, Annual Assembly (1960), 65, 484, 536; Houdremont lecture (1959), hydrogen in welding, by P. G. Bastien, 546; list of terms used in ultrasonic testing (*book review*), 481; radiographic inspection of fusion-welded joints, 410; reference blocks for checking ultrasonic inspection apparatus, 230; Reports of Commissions (1959), 454; work of, 380
Irvine, K. J., biographical note, 384
Irvine, K. J., and **Pickering, F. B.**, microstructure and mechanical properties of mild steel weld deposits, 353

Jackson, D. R., *see* Tomlinson, J. E.
James, D., *see* Sawkill, J.
John, W. G., biographical note, 533; influence of welding on design of ships, 491; Third Annual Lecture, 289
Johnson, G., obituary, 660
Johnson, L. G., Cannon, J. C., and **Spooner, L. A.**, preloaded bolted joints, 560
Johnstone, L. A., Trotter, F. J., and **a'Brassard, H. F.**, high frequency resistance welding, 238

Kaesmacher, P., biographical note, 714; *see also* Kauhausen
Kauhausen, E., biographical note, 714
Kauhausen, E., Kaesmacher, P., and **Sadowski, S.**, high-temperature service materials, 693
Kelly, C. I., Cornwell pilot plant, 148
Kerensky, O. A., fatigue of welded structures, 517, 525, 526
Kerr, D. M., welding production management, 156
Koenigsberger, F., fatigue of welded structures, 529
Kristal, N. M., *see* Shvartz, G. L.

Lane, P. H. R., and **Rose, R. T.**, design of welded pipe fittings, 387
Lee, E. H., fitting inaccuracies, distortion, and design for welding, 157
Lewis, E. M., biographical note, 291; fatigue in welded structures, 265, 472, 523, 581; future research—engineering aspects, 582
Light alloys, semi-automatic welding with fine wires, 346
Lismer, R. E., low temperature properties of Al–Mg alloys, 147; *correction*, 388
Lister, E., fatigue of welded structures, 475
Low-temperature properties, of Al–Mg alloys, 147; of welded and unwelded Al–Mg alloy plates, 147
Low-temperature service, extruded aluminium alloys for, 147
Lucey, J. A., *see* Brimble, R. V.
Lummus, M. H., multi-spot welding, 156

McDonald, T. J., biographical note, 482
McDonald, T. J., Eaton, N. F., and **Wright, D. B.**, fusion welding of beryllium, 441
Mackenzie, I. M., fatigue of welded structures, 582
McLester, R., biographical note, 218; *see also* Gunn, K. W.
McWilliam, J. A., biographical note, 660; *see also* Morley, J. I.
Magnesium alloy nuclear fuel cans, 616
Makin, S. M., Alcock, C. B., Arkell, D. R., and **Pfeil, P. C. L.**, distribution of P and S, 595
Management, welding production, 156
Manganese, addition to Cr–Ni weld metal, 38
Manual for plastic welding, 576
Manuel, L., production metallizing machines, 323
Marshall, W. K. B., hot cracking in mild and alloy steels, 451; hot cracking in welds (*Letter*), 587; Rockweld-Vus electro-slag welding machine, 393
Martensitic steel, low-C, welding, 652
Martin, H., stud welding, 157
Material transfer characteristics, Al in argon, 102
Mechanical properties, of mild steel weld deposits, 353
Metal and Plastic Coatings Association, annual general meeting, 220
Metal spraying, automatic plant, 316; development and equipment for, 312; powder process, 312; production machines, 323; reclamation by, 223; spray fusing, 318; surface preparation, 314; wire spraying, 312
Metal transfer, in inter-gas shielded arc welding, 101; in metal-arc welding, 343
Metallizing, *see* Metal spraying
Metallurgy, aspects of future research, 582; of research on fatigue of welded structures, 212; of welding (*book review*), 59; welding, of Nimonic alloys, 605
Microstructure, mild steel weld deposits, 353; of normalized C steel, effect of heating and cooling on, 557
Mild steel, butt welds in, fatigue strength of, 169; chemical composition and hot cracking in, relationship between, 451; fatigue strength of butt welds in, 472; notch toughness, effect of arsenic, 129; semi-automatic welding with fine wires, 347; weld deposits, microstructure and mechanical properties, 353; weldability, effect of arsenic, 129; welds, fatigue strength values, 162, 524
Millar, B. R., obituary, 63
Milner, D. R., *see* Needham, J. C.; Salter, G. R.; Vaidyanath, L. R.; Wilkinson, J. B.
Milner, D. R., Salter, G. R., and **Wilkinson, J. B.**, arc characteristics, 73
Mitchell, B., biographical note, 714; *see also* Asbury, F. E.
Modlen, G. F., fatigue of welded structures, 527
Molybdenum addition to Cr–Ni weld metal, 39
Monel, welding, 648

Morgan, L. H., welding production management, 158
Morley, J. I., biographical note, 686
Morley, J. I., and **McWilliam, J. A.,** precipitation-hardening steel, 651
Munse, W. H., biographical note, 291; fatigue of welded structures, 527, 528; *see also* Stallmeyer, J. E.
Munse, W. H., and **Stallmeyer, J. E.,** fatigue strength of welded beams and girders, 517; influence of weld details on fatigue, 188
Murex, hot cracking test, 136

Needham, J. C., Cooksey, C. J., and **Milner, D. R.,** metal transfer in inert-gas shielded arc welding, 101
Neumann, A., biographical note, 291; fatigue strength values of mild steel welds, 162, 524; fatigue of welded structures, 522
Newman, R. P., fatigue strength of butt welds, 169, 472; fatigue of welded structures, 477, 480, 525, 529, 581, 586
Nicholson, A., fatigue of welded structures, 474, 476, 480
Nickel electrodes, 706
Nickel alloys, welding for high-temperature service, 705
Nimonic alloys (*book review*), 685; brazing, 613; welding metallurgy of, 605
Niobium addition to Cr–Ni weld metal, 36
Nitrogen addition to Cr–Ni weld metal, 39
Non-destructive testing, in ship construction, 499
Notch toughness, mild steel, effect of arsenic, 129
Nuclear fuel elements, welding problems, 615
Nunn, E. G., biographical note, 384; *see also* Harper, M. E.

Offset between plates, effect on fatigue properties of butt welded aluminium, 204
O'Neill, H., lecture to young people, 288
Oxidation, resistance to, sprayed metal coatings for, 305
Oxides, plasticity of (*letter*), 237
Oxy-acetylene welds, in mild steel, microstructure of, 353
Oxygen addition to Cr–Ni weld metal, 39; effect of additions in CO_2-shielded metal arc welding, 15

Pfeil, P. C. L., *see* Makin, S. M.
Phillips, C., biographical note, 433; spot welding of C–Mn steel, 396
Phosphorus, addition to Cr–Ni weld metal, 31; distribution in austenitic stainless steel welds, 595; radioactive, 596
Pickering, F. B., biographical note, 384; *see also* Irvine, K. J.
Pipe, design of welded fittings (*handbook*), 387; Monel, welding, 648
Plasma flame spray gun, for hard-facing, 327
Plasma jets, in welding arcs, 119
Plastic properties, of rolled sections, 220
Plastic welding, manual for, 576
Plasticity, of oxides (*letter*), 237
Plates, Al–Mg alloy, low-temperature properties, 147; with fillet welded attachments, influence of residual stresses on, 415
Polyvinyl chloride, welding, 576
Porosity, effect on fatigue properties of butt-welded aluminium, 204
Portal frames, test on pitched, 679
Positional welding, of steel with CO_2 process, 458
Powder weld process, 322
Power stations, cracking in welded joints of austenitic steel, 667
Precipitation-hardening steel, welding of, 651
Pressure welding, cold, surface preparation in, 1; hot, Ti, 708
Proschek, F., *see* Gunther, W.

Radiography, auto, 596; fusion-welded joints, 410
Rare metals, high frequency resistance welding, 248
Reclamation, by metal spraying, 223
Reeve, Fillet Weld Test, 133
Research, future, engineering aspects, 582; future, metallurgical aspects, 582
Residual stresses in cylindrical vessels, 21; distribution due to local compression of infinite thin plate, 430; fatigue strength of fillet welded joints improved by induced, 185; influence on fatigue strength of plates, 415; recent work on, 184; report of Commission, 456
Resistance welding, nuclear fuel elements, 617; Thermatool high frequency process, 238
Riveted joints, comparison with welded joints in fatigue, 263
Roberts, G., economics of welding, 156; site welding, 158
Rockweld-Vus electro-slag welding machine, 393
Rollason, E. C., electric arc, 71
Rolled sections, plastic properties of, 220
Roofs, test on pitched portal structure, 679
Rose, R. T., stresses in cylindrical vessels, 19; *see also* Lane, P. H. R.
Ross, S. C., obituary, 713
Russell, J. E., fatigue of welded structures, 474, 480, 587
Russia, welding delegation to U.K., 715; welding research and practice in, 716

Sadowski, S., biographical note, 714; *see also* Kauhausen, E.
Safety and **health** in fusion welding of Be, 441
Salter, G. R., biographical note, 141; *see also* Milner, D. R.
Salter, G. R., and **Milner, D. R.,** arc atmospheres, 89
Sawkill, J., and **James, D.,** tear tests on Al–Mg alloys, 147
School of Welding Technology, activities and courses, 542; courses, 63, 141, 142
Schütz, W., fatigue of welded structures, 581
Seaman, M., numerical data processing, 158
Séférian, D., metallurgie de la soudure (*book review*), 59
Senior, A. G., fatigue of welded structures, 528
Seymour-Semper, E., message from retiring President, 530
Shaw, P., efficient use of floor space, 158
Sheet, CO_2 welding of, 463
Ship construction, non-destructive testing, 499
Ships, corrosion, 502; influence of welding on design, 491
Shrinkage, brittleness theory of, 49
Shrinkage-brittleness theory, 509
Shvartz, G. L., and **Kristal, N. M.,** corrosion of chemical apparatus (*book review*), 431
Sigma-phase formation, 42
Silicon, addition to Cr–Ni weld metal, 33
Slags, function of welding, 600; viscosity and surface tension, 601
Smith, A. A., effect of oxygen additions in CO_2-shielded metal arc welding, 15; positional welding with CO_2, 458; *see also* Brain, A. G.
Spooner, L. A., *see* Johnson, L. G.
Spot welding of C–Mn steel, 396; multi-spot, economics of, 156
Spray fuse process, metal spraying, 318
Spray welding, hard-facing by, 228; materials for hard-facing, 308; principles of, 307
Sprayed metal, coatings, 312; coatings for abrasion, corrosion, and oxidation resistance, 305; *see also* Metal spraying
Stainless steel, austenitic, distribution in P and S welds, 595; austenitic, welding, 643; nuclear fuel element welding, 620; semi-automatic welding with fine wires, 350
Stallmeyer, J. E., biographical note, 291; *see also* Munse, W. H.
Stallmeyer, J. E., and **Munse, W. H.,** fatigue strength of welded joints, 477; fatigue of welded joints, high-strength steels, 281
Standardization, report of Commission, 456
"Stellite" powders, for hard-facing, 318
Stiffeners, influence of weld details on fatigue, 194; welded to tension flange, fatigue strength of beams with, 569
Stoll, A., *see* Erker, A.
Strain theory of hot tearing, 509
Straps, influence on fatigue, of welded beams, 198
Stress(es), in cylindrical vessels, 19, (*letter*), 249; distribution in cylindrical vessels, 21; due to welding, effects of, report of Commission, 457; mean, effect on fatigue of Al-alloy butt-welded joints, 201, 577
Stress-relief of circumferential welds, 19; report of Commission, 456
Stress-rupture, cracking, theories of, 55; measurements in welded Cr–Ni steels, 49
Structures, non-equilibrium, formation of, 215
Stud welding, structural applications, 156
Sulphur addition to Cr–Ni weld metal, 29; distribution in austenitic stainless steel welds, 595; radioactive, 596
Surface coating for increasing fatigue strength, 210
Surface preparation in cold pressure welding, 1

Tait, D. B., *see* Brimble, R. V.
Tantam, D. H., low-temperature properties of Al alloys, 149
Taylor, A. F., biographical note, 661; nuclear fuel elements, 615
Taylor, R. W., and **Chapman, J. C.,** stud welding, 156
Tear tests on Al–Mg alloys, 147
Terminology, report of Commission, 455
Terrington, J. S., fatigue of welded structures, 522
Testing, report of Commission, 455; *see also* Inspection and testing

Thermatool process, performance record of, 238
Thermit welding (*book review*), 311
Thompson, A. G., economics of welding, 156
Thorneycroft, D. R., biographical note, 661; *see also* Hinde, J.
Titanium, hot pressure welding, 708
Toft, L. H., biographical note, 714; *see also* Asbury, F. E.
Tomlinson, J. E., and **Jackson, D. R.,** low temperature properties of Al–Mg alloy plates, 147
Tomlinson, J. E., and **Wood, J. L.,** fatigue of welded Al, 250, 577
Translations, 438
Trotter, F. J., *see* Johnstone, L. A.
Tucker, N. A., obituary, 660
Tylecote, R. F., *see* Wilford, C. F.
Tylecote, R. F., and **Wilford, C. F.,** plasticity of oxides (*letter*), 237

Ultrasonic testing, list of terms used in, 65; reference blocks for checking apparatus, 230; terms used in (*book review*), 481
United Kingdom Atomic Energy Authority, welding in chemical plants, 643

Vaidyanath, L. R., and **Milner, D. R.,** surface preparation in cold pressure welding, 1
Vanadium, addition to Cr–Ni weld metal, 39
Van der Willigen, P. C., *see* Defize, L. F.
Van Ouwerkerk, L., obituary, 141

Watkins, B., biographical note, 661; *see also* Dickinson, F. S.
Weck, R., Al alloys, 147; fatigue of welded structures, 161, 472, 478, 480, 525, 527, 583; residual stresses, 151
Weld beads, effect of shape on fatigue properties of butt welded aluminium, 204
Weld defects, influence of, 176
Weld deposits, mild steel, microstructure and mechanical properties, 353
Weld metal, cracking, 27, 56; cracking, theories of, 49; properties in electroslag welding, 340; tests, 631
Weldability, assessment by cracking tests, 623; mild steel, effect of arsenic on notch toughness, 129
Welded constructions, design and calculation of (*book review*), 216
Welded joints, austenitic steel, cracking in, 667; comparison with riveted joints in fatigue, 263; fatigue of, 214; fatigue strength in high strength steels, 477; fillet, fatigue tests on, 286; in high-strength steels, fatigue of, 281; longitudinal butt, fatigue tests on, 284; radiographic inspection, 410; transverse butt, fatigue tests on, 281; *see also* under specific types of welded joint
Welded steel, comparison with cast and wrought steel, 546
Welded structures, cumulative damage in, 272; design of, effect on fatigue properties of butt-welded aluminium, 207; fatigue of, future research-engineering aspects of, 265; fatigue of, metallurgical aspects of future research, 212; fatigue of, symposium on, 144, 161, 250, 265, 272, 281; fatigue of, symposium on, discussion at, 472, 513, 577; fatigue testing of full-size assemblies, 272, 517
Welder's Handbook (*book review*), 685
Welding, behaviour of metals subjected to, report of Commission, 456; in chemical plants, 643; economics of, 156; handbook (*book review*), 59; high-temperature service materials, 693; hydrogen in, 546; influence on design of ships, 491; nuclear fuel elements, 615; technology of (*book review*), 678; *see also* under specific types of welding
Welding production management, 156
Welds, austenitic stainless steel, distribution of P and S in, 595; circumferential, stress relief of, 19; hot cracking in, 558, 587; mild steel, fatigue strength values, 162, 524; super-solidus cracking in, 508; *see also* under specific types of weld
Wells, A. A., fatigue of welded structures, 475
West, E. G., low-temperature properties of Al alloys, 147
West, H., elected Vice-President for 1960–61, 531; biographical note, 531
Whitman, J. G., biographical note, 291; fatigue of welded structures, 528
Whitman, J. G., and **Alder, J. F.,** fatigue tests on welded steel structures, 272; programmed fatigue tests, 517
Wilford, C. F., biographical note, 714; *see also* Tylecote, R. F.
Wilford, C. F., and **Tylecote, R. F.,** hot pressure welding of Ti, 708
Wilkinson, J. B., *see* Milner, D. R.
Wilkinson, J. B., and **Milner, D. R.,** heat transfer from arcs, 115
Wise, S., fatigue of welded structures, 475, 478
Wood, J. L., biographical note, 291; fatigue strength of Al-alloy welds, 365; *see also* Tomlinson, J. E.
Woods, P. F., biographical note, 534; brazing of Al-alloys with air/propane, 489
Work hardening, mechanisms of, 212; and S/N diagram, 213
Wright, D. B., biographical note, 483; *see also* McDonald, T. J.
Wright, J. W., obituary, 589
Wrought steel, comparison with welded and cast steel, 546

Young, J. G., fatigue of welded structures, 577, 579; *see also* Bartle, P. M.
Younger, R. N., *see* Borland, J. C.

Zirconium, addition to Cr–Ni weld metal, 39